WMG Service Systems Research Group
Working Paper Series

Market Design for a Property Rights System with Entitlements for Individuals

Irene C L Ng

ISSN: 2049-4297
Issue Number: 01/2

Market Design for a Property Rights System with Entitlements for Individuals

Ng, Irene C L
Professor of Marketing and Service Systems
Service Systems Group, Warwick Manufacturing Group,
University of Warwick, Coventry CV4 7AL, UK.
Tel: +44 (0) 247652 4871, E-mail: irene.ng@warwick.ac.uk

WMG Service Systems Research Group Working Paper Series
Issue number: 01/21
ISSN: 2049-4297
November 2021

If you wish to cite this paper, please use the following reference:

Ng I C L (2021) Market Design for a Property Rights System with Entitlements for Individuals. *WMG Service Systems Research Group Working Paper Series*, paper number 01/21, ISSN 2049-4297.

Introduction

There has been much written about whether information can have property rights per se. Liddell, Simon and Lucassan (2021) provided an excellent treatment on this topic. Their conclusion is, as also noted by several other authors in the past, that information cannot be a subject of property, but other forms such as inventions or databases would qualify under an intellectual property framework with rules such as eligibility, criteria, scope and duration of protection etc. in place such that a successful system of property could prevail. Liddell et. al. further goes on to state, however, that individuals would rarely be considered owners of the information within such a qualifying framework as they are not the generators of the information nor did they collect it in the first place.

While it is true that individuals would not normally be owners of such information, what would a successful system of property be if they could?

The technological capability of organisations in collecting and generating information is that of owning the servers, databases and the ability to control, store and process. That they have intellectual property rights over the information and therefore hold entitlements, is not disputed. If individuals have the same capability, and therefore also be able to hold entitlements, how then should the system of property be constructed?

Of course, having the ability to hold entitlements is not the same as actually having the information, since much of the information individuals may wish to own reside elsewhere.

Nonetheless, it is an important starting position as the ability of individuals to hold entitlements brings about their ability to contract on their entitlements and that makes Coasian Economics relevant. Coase proposed that, under the right conditions, any dispute over property rights could result in an optimal solution economically, regardless of how the property rights are distributed in the first place, as long as parties have the ability to bargain and transaction costs can be kept low. Clearly, economic optimality for parties may not be optimal for social welfare, societal outcomes and may create other externalities. Yet, a market for such a system of property has not yet been fully investigated and cannot be dismissed outright.

Axiom: the Entitlements of Natural Persons

For the purpose of legal clarity, we will refer to parties with the ability to contract as legal persons (which could be non-human such as an organisation or a sovereign state, or human if they are able to contract) to differentiate from natural persons. This distinction matters as the subject matter of this paper - that of personal information - may impose inalienable restrictions on transferability, ownership, and its use by legal persons may differ contractually if legal persons are natural persons contracting for themselves.

This paper begins with the axiomatic principle - *that natural persons can be legal persons attributed with intellectual property rights over information under current qualifying frameworks of property such as a server and its associated storage system*. This means that both organisations and individuals can therefore hold entitlements in the same way. On the

basis of such an axiom, all natural persons on the Internet are legal persons and can enter into contracts for their entitlements.

An important clarification of the axiom is that we are not proposing that information be propertized; extant literature has discussed extensively on the negative consequences of such a concept including, for example, incentivising privacy for sale etc. Liddell et al's treatment of the issue is comprehensive in why that is a bad idea. Instead, our axiom is on rights over information held at rest with the same processing, computation and storage capability of organisations; the ability to use and to transfer, the right to exclude, the right to give rights; in other words, entitlement **not** of propertized information, but to the qualifying framework within which the information resides in, such as a database operated on with processing capabilities such as a server.

By entitlement, we mean legal entitlements that are expressed in most work on property rights, including intellectual property rights in law and economics and we adopt Rose-Ackerman (1985) classification of entitlement rules by ownership, use, and transferability.

The Property Systems

Under any property system, entitlement holders of information face different restrictions on the ownership, use and transferability of their property. These restrictions can be due to regulatory concerns, designed to produce some benefit or prevent some undesirable activity. We replicate the Rose-Ackerman taxonomy below for the purpose of classifying the system.

Use: Restrictions in use

	Restrictions on **Use** of Information by all legal persons		
	Nothing is required	All permitted activities are also required	Some permitted activities are also required
Nothing is permitted	1		
Nothing is forbidden	2		3
Some activities are permitted and others are forbidden	4	5	6

Transferability: disposal of entitlements

	Restrictions on **Transferability** of Information by all legal persons	
	Gifts permitted,	Gifts Forbidden

Sales permitted	Pure Property (A)	Modified Property (B)
Sales forbidden	Modified inalienability (C)	Pure inalienability (D)

Ownership: Who may hold the entitlement

Who may hold the entitlement	
Anyone	a
Only some specified groups	b
Everyone simultaneously	c
No one	d

For the use of information, we would classify current markets as (2) which means all use of the information by the entitlement holder is permitted with nothing required. There are some required activities to be carried out i.e. ensuring the information is secure, although these are strictly not enforceable requirements.

For transferability of information, both systems are classified as (A) where all gifts and sales are permitted. This is the area of intense debate, and why inalienable rules are coming in to protect individuals and their rights to privacy.

The final letter is where the classification is different between the two systems. Based on the axiom, our system is (a) whilst current systems are (b). The difference is argued by Ng (2018).

The two property systems can be summarised as follows:

1. Current system where only specified groups (organizations) hold entitlements, with no restrictions of use and transfer of property **2.A.b**.
2. A new system where anyone can hold entitlements, with no restrictions on use and transfer of property **2.A.a**.

Analysis

An Economist will immediately see that 2.A.a is derived from 2.A.b. 2.A.a attempts to solve the externality problems of 2.A.b by "internalizing" the externalities through a "separate facilities" solution. Property relationships are rearranged so that those who produced the externality (buying and selling private information) are separated from those who would suffer from the externality (individuals).

What are the market rules for this new system of property? There is little guidance on how such a market would behave nor the rules of engagement. Such a system accepts, ex-ante,

that all property rights over information belong to any legal person that collects it. That means that the market will begin with all information being held by organizations and through bargaining solutions brought about by market design, prices may be low enough to transfer information to individual entitlements.

The Market Design

When would prices be lower in 2.A.a? This would depend on the design of the market structure that could match data sources and merchants to create the necessary thickness, reduce congestion and ensure safety (Roth, 2008). The challenge is to discover, design and build the most efficient market structure that can be implemented technically through a digital system that would emerge a functioning market for data sharing and portability under 2.A.a.

The 2.A.a Property System operationalised

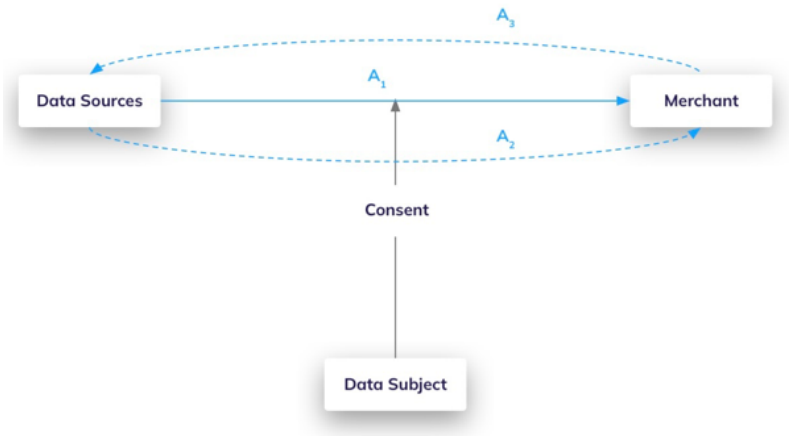
The 2.A.a property system was operationalised through the invention of the HAT Microserver or a Personal Data Server (PDS), an open sourced technology created through a research project of 6 U.K. universities that provided individuals with entitlements through the legal ownership of the server and its corresponding storage system. The technology was commercialised by Dataswift, a U.K. deep tech startup in Cambridge that deployed the open sourced technology into a patented infrastructure platform to scale the Data Servers and provide a Personal Data Account (PDA, a subset of the PDS) Management System that could be provisioned on demand for any application or website. The platform also comprised a policy stack to ensure information flows are safe. This enabled individuals to have the ability to store, control, process, and share their data through personal data accounts. The technology began rolling out in 2020. The author is the CEO and the primary inventor of the technology and this paper reports the design and development of the market from 2020-2021.

Initial design and execution of 2.A.a personal data markets

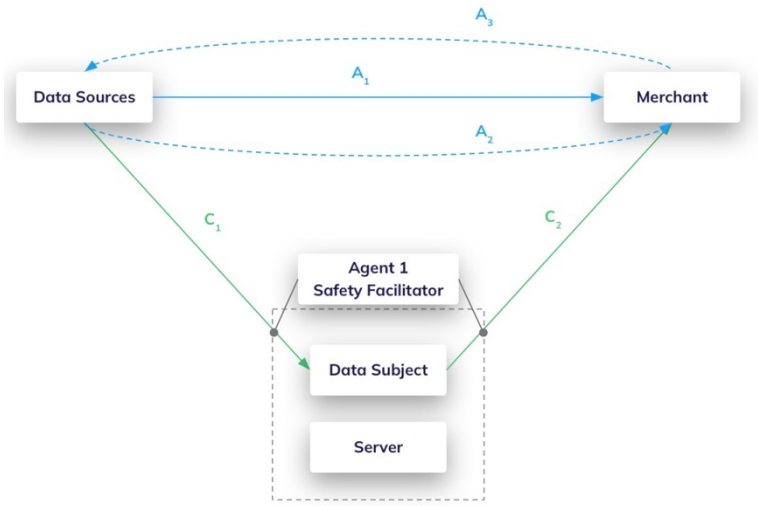
Data portability in the current 2.A.b property system is presented below. In this system, individuals do not hold entitlements and therefore have to consent to their data being shared. I assume firms that wish to obtain data wish to do so to improve customer acquisition, and therefore the cost of converting a customer is a function of the cost of obtaining customer data and the total cost includes the cost of targeting a customer either by buying audience lists or advertising. Hence

A_3= Cost of targeting a customer (advertising or buying audience lists)
A_2= Cost of converting a customer
A_1= Cost of obtaining customer data

Total Cost of Acquiring a customer $A = A_3 + A_2 (A_1)$



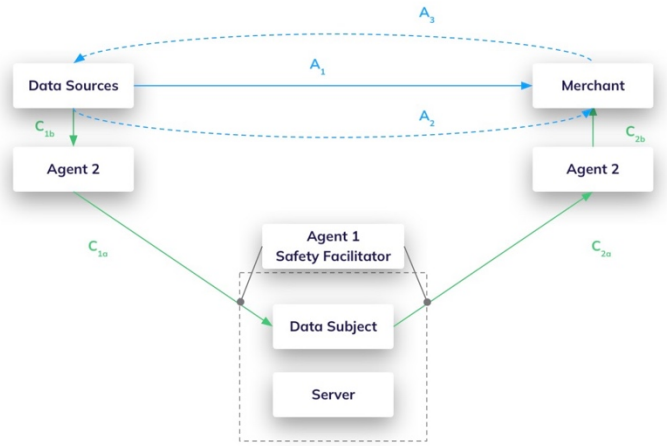
With entitlements, the property system 2.A.b is depicted below.



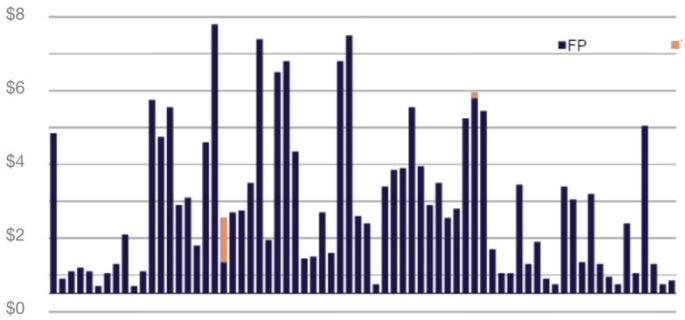
I make the assumption that there is an agent 1, a facilitator, to ensure there is safety in transacting, otherwise the market would fail. I propose that this market will fail to emerge, as C_1+ C_2, even at its lowest, will only impact on A_1. This is because even if the routing of data through the data subject has lower transaction costs and may be an alternative to the 2.A.b system, it does not not provide the solution for targeting or converting a customer. Thus, as a pure infrastructure technology, a market will fail to emerge that is a viable alternative to the 2.A.b property system.

The first market structure – special case

A special case did emerge for 2.A.a in Brazil, from September 2020 till June 2021. A client of Dataswift took on an agent role to match Facebook sourced data with a micro lender. The motivation was to improve customer acquisition for the merchant and the merchant agreed to obtain an agreed "risk score" created from a psychographic profile of the individual and his/her Facebook data. The process would entail offering individuals who have failed to obtain a micro loan on the lender's website to be given a second chance by acquiring data from Facebook into their Personal Data Account through an agent and then sharing it through the agent to the merchant in combination with a psychographic survey. This process is shown below.



The roll out for the market led to 2,611 Personal Data Servers issued from August 2020 to June 2021 with the micro lender, increasing lending by 20%. A snapshot of the Agent 1 daily revenues from Facebook data is shown below. (Agent 2 revenues mirror Agent 1)



While successful, this market is clearly a special case where

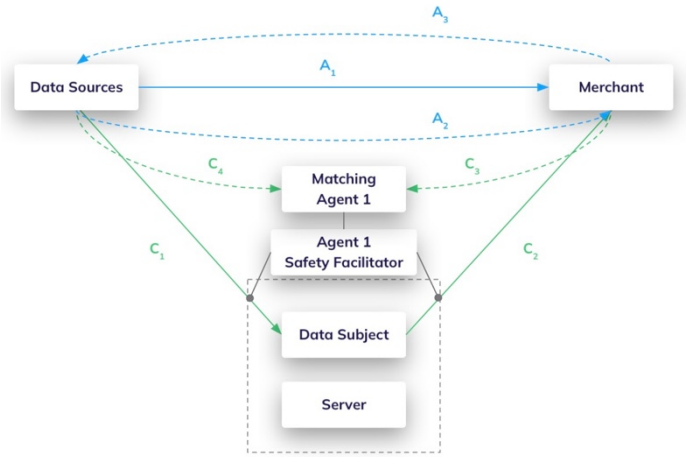
$C_{2a} + C_{2b} + C_{1a} + C_{1b} < A$

This special case corrected a market failure caused by asymmetric information where customers do not have a way to signal their risk type. Thus, the cost of A is prohibitive, resulting in the ability for a market to form under the 2.A.a system as an alternative. The market design question is if there can be a market for a general case and if so, how can it be structured?

The second market: the City of Elyria

The second market design attempted to consider only information matching for audience targeting and conversion, rather than acquiring data.

A matching agent was created with a technical service called a "Data Passport" where it can enable a data subject to use the PDS to acquire data from sources as a "passport holder", declare his information type through a "Data Pass" (but not give the data) to enable interested Merchants to offer services for that information type. The design of this service is specifically to provide an alternative to the cost of A_1 and A_2 in the 2.A.b system with the cost of C_3 and C_4 to see if prices for the 2.A.a system can be low enough.

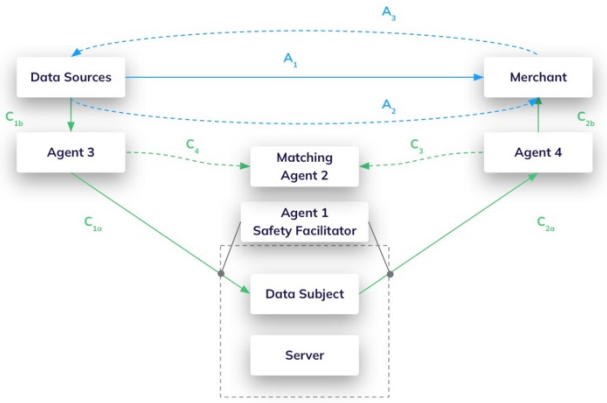


This design was rolled out in August 2021 by partnering with the City of Elyria in Ohio to create a "living lab" environment for the market. The technical design and specification of the Data Passports was built and tested "in the wild". Businesses were recruited to understand how they would engage with being Merchants and if they would offer services for the audience of passport holders.

10 merchants signed up when offered the opportunity to target and convert city residents, suggesting that such a match was possible. However, with only one Data Pass (city resident), the conclusion was that it was insufficient "thickness" for the market to be sustainable.

The Third Market: Weight loss in Malaysia

The third market combined the first and second market structure in an attempt to create thickness and distribute coordination costs to multiple firms.



The market structure was a 4-sided market with a matching agent called a "Data Passport Issuer" that issued Data Passports to data subjects, enabling them to acquire their data from data sources through agent 2, a Data Pass Supplier (second side) and from the attribute of the data, be matched with agent 4 that represented merchants (third side) that sought audiences with that attribute. This was called the "Data Pass Network", a network of Consumer Firms that share their data by creating Data Passes for data subjects to acquire and be a target audience for other Consumer firms. The network was designed to combine targeting, converting and sharing data into one system on the premise that customers of

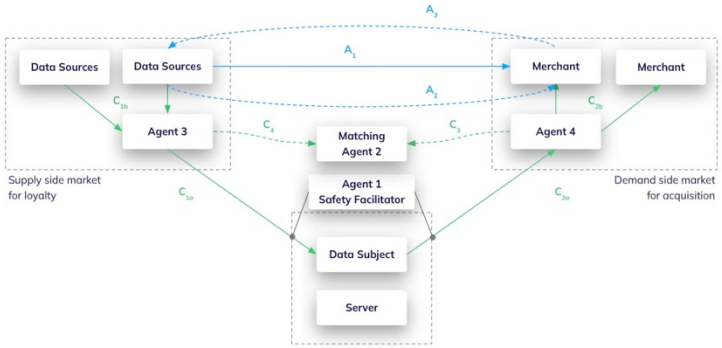
one consumer firm are the potential customers of another consumer firm and it was the role of the matching agent to match both sides.

The network was executed by Dataswift and commercial clients that used it in a nationwide weight loss campaign to track the weight loss of data subjects. The data source formed a campaign to lose 1m KG of collective weight amongst Malaysians and used the Data Pass network to provide measurement and coordination with merchants that specifically wished to target the customer type engaged in losing weight.

Discussion

At the time of publishing this report, both Elyria and Malaysian markets are being rolled out under close observation of how the market structure may evolve. While the 2.A.a property system market was being rolled out, transaction costs in 2.A.b have been increasing due to increased regulation over the rights of individuals within the 2.A.b system. It is possible that transaction costs may then become so high in 2.A.b that market players would switch to 2.A.a.

Even within 2.A.a, inalienable rights to privacy and restrictions on transferability may need to exist to ensure safety in transaction although the intervention would be different to achieve the same outcomes. Coordination costs are likely higher in 2.A.a but the ability to separate supply side from demand side market due to entitlements of individuals could result in lower transaction costs overall.



Most importantly, the treatment of externalities, namely privacy, would be different. For 2.A.b, inalienable rules such as consent and data protections are imposed for the transferability of information. However for 2.A.a where private contracts are allowed, different kinds of interventions might be needed, for example reducing coordination costs through private contracts with agents, since entitlements can be held. It is therefore clear that the market rules for 2.A.b and 2.A.a property systems would be quite different.

Another key difference between 2.A.b and 2.A.a property system is the focus on entitlements v the actual information. 2.A.b property system has the conundrum of not all parties being able to hold entitlements, and therefore the information itself has to be the focus, and that brings tremendous challenges in the management of externalities as well as coordination and transaction costs well established in literature. 2.A.a, conversely, does not have such a constraint, and therefore it manages the information assets from within the entitlements, which should lower transaction costs. However, the externalities, coordination problems and distributive goals of 2.A.b loom just as large for 2.A.a and they would be salient market design issues. However, the biggest challenge of 2.A.a is to enable bargaining

and the setting up of incentives to create optimal economic solutions for the transferability of the information to data subjects. With the non-rivalrous property of Information, this may not be too costly for the firms. Indeed Cañon and Ng (2021) demonstrated that the 2.A.b property system creates bottlenecks for Open banking and the 2.A.a system may yet be a good alternative.

Conclusion

The market design reported here considered the structure of markets when individuals are able to hold entitlements and investigated structures that could enable optimal and scalable transferability of data from the legal, economic and technical perspective. The challenge was not merely market design, but to construct a technical platform that could lower transaction costs for the transferability of data that is contractually agreeable to all parties, but that would be have lower prices than the 2.A.b property system.

Overall, we were able to create a technologically advanced platform that provided a rule based system where entitlements of data should reside with individuals while ensuring the transferability of a data asset to reduce transaction costs. In so doing, coordination costs are internalised to the agents, creating business propositions for a scalable technical multi-sided market for the sharing of data and also the sharing of audiences that the data represents. This created the first possible multi sided market structure on a technology platform within a 2.A.a system. The market design for the 2.A.a property system is in the process of scaling into multiple networks. Further studies would be reporting the state of the market and comparing that to the 2.A.b property system.

References

Canon, Carlos and Irene C L Ng, (2021) “A bottleneck for Open Banking,” working paper

Liddell, Katherine, David A Simon, Anneke Lucassen, (2021) “Patient data ownership: who owns your health?”, Journal of Law and the Biosciences, Volume 8, Issue 2, July-December 2021,

Ng, Irene C. L. (2018) Can you own your personal data? The HAT (Hub-Of-All-Things) data ownership model. Working Paper. Coventry: Warwick Manufacturing Group. WMG Service Systems Research Group Working Paper Series (02/18). (Unpublished)

Ng, Irene C. L. (2018) The market for person-controlled personal data with the Hub-of-all-Things (HAT). Working Paper. Coventry: Warwick Manufacturing Group. WMG Service Systems Research Group Working Paper Series (01/18). (Unpublished)

Rose-Ackerman, S. (1985). Inalienability and the Theory of Property Rights. Columbia Law Review, 85(5), 931–969. https://doi.org/10.2307/1122458